

Application No. 09/816,672
Amendment Under 37 C.F.R. §1.111 dated October 20, 2004
Response to the Office Action of July 21, 2004

REMARKS

Reconsideration of this application, as presently amended, is respectfully requested. Claims 1 - 14 are now pending in this application, new claims 8 – 14 having been added by the present Amendment. Claims 1 – 5 and 7 stand rejected. Claim 6 was objected to, but indicated allowable if rewritten in independent form.

Claim 6 has been rewritten in independent form to include all the features of base claim 1 and intervening claim 5. Accordingly, it is submitted that claim 6 is now in condition for allowance.

Objection to the Title

The title of the invention was objected to for allegedly not being descriptive. The title has been replaced with a new title which is believed to be descriptive of the invention. If the new title is not considered acceptable, the Examiner is invited to supply a title that is considered to be clearly descriptive of the invention.

Amendments to the Specification

The Specification has been amended to correct minor informalities. No new matter has been added. Approval and entry of the changes to the specification are respectfully requested.

Rejections in view of the Prior Art

Claims 1 and 7 were rejected under 35 U.S.C. §102(b) as being anticipated by **Ohta** (USP 5,101,276). Claims 2 – 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over **Ohta**. Claim 1 was rejected under 35 U.S.C. §102(e) as being anticipated by **Yadid-Pecht et al.** (USP 6,115,065). Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over **Yadid-Pecht et al.** in view of **Ishikawa et al.** (USP 4,670,777). For the reasons set forth in the detail below, these rejections, to the extent they are considered to apply to the amended claims, are respectfully traversed.

Claims 1 and 7

Claim 1 has been amended to recite that the first exposure and the second exposure are started simultaneously. Support for this claim amendment is provided in the present application, e.g., page 15, lines 21-22.

The present invention is directed to a digital camera that extends the dynamic range of an image signal by combining charge acquired by long time exposure and charge acquired by short time exposure.

More particularly, in accordance with the present invention, first light receiving elements are subject to exposure for a first period and second light receiving elements are subject to exposure for a second period. The first period is shorter than the second period and overlapped in time with the second period. A first charge produced in the light receiving elements as a result of the first exposure and a second charge produced in the light receiving elements as a result of

the second exposure are separately output, and a still image is generated on the basis of the first charge and the second charge.

The Ohta reference

Ohta discloses an electronic still camera for photographing a plurality of images using different exposure times, wherein the different exposure times may be accomplished in an overlapped fashion (column 4, lines 17 -27).

In rejecting claims 1 and 7, the Examiner refers to Figs. 1-3 of **Ohta**. Figs. 1-3 **Ohta** disclose a frame interline transfer (FIT) CCD sensor 3 which apparently operates in a frame integration¹ type storage mode, as **Ohta** discusses “discarding unnecessary charges generated at the transfer unit and memory unit of the CCD 3” (see column 8, lines 36-38).

As disclosed in column 7, lines 59 – column 8, line 19 and Figs 2A-2E of **Ohta**, the CCD 3 is driven in a frame storage mode wherein a signal of field A is first read out, and, at a suitable time interval thereafter, a signal of field B is read out. As shown in Figs. 2B and 2C, the exposure timings of fields A and B are overlapped.

Further, in column 8, lines 42-59 and Fig. 3, **Ohta** discloses combining images of different exposures to obtain an image of wider dynamic range. However, as shown in Fig. 2 of **Ohta**, the exposure timing of field B starts after that of field A.

¹ **Frame Integration**

In a frame integration mode, only the even or odd field is repeatedly read from the image sensor, while the other field is discarded. This results in a full-size frame that contains only the even or odd field available on the image sensor.

Although the exposure timing taught by **Ohta** is overlapped, unlike the presently claimed invention, **Ohta** do not disclose or suggest that the exposure timing for fields A and B start simultaneously.

Claim 7 depends from claim 1 and is allowable for the same reasons as claim 1 by virtue of its dependency on claim 1.

Claims 2 - 4

Claims 2 – 4 have been amended to clarify features of the invention.

Dependent claims 2 - 4 depend either directly or indirectly from claim 1 and distinguish over **Ohta** for the same reasons set forth above with respect to claim 1. Dependent claims 2-4 also distinguish over **Ohta** for the additional reasons set forth below.

For example, dependent claim 2 recites “a third applier to apply a single charge sweep-out pulse to both said first light receiving elements and said second light receiving elements.” The Examiner asserts that the *discarding* of charges disclosed in column 9, lines 52 and 54-55 of **Ohta** corresponds to the claimed “charge sweep-out pulse” (see Office action, page 5, item 1, lines 7-10). Although **Ohta**’s description of the discarding of charges is somewhat unclear, it is clear that the charges for field A and field B are discarded *separately* (i.e., at ① in Fig. 7B and at ② in Fig. 7C). In contrast, according to the present invention, a “single charge sweep-out pulse” is applied to “both said first light receiving elements and said second light receiving elements.”

Moreover, claim 3 recites that the “first exposurer controls start and end time points of the first exposure by said third applier and first applier[s], respectively, and said second exposurer controls start and end time points of the second exposure by said third applier and said shutter member, respectively.” Thus, according to claim 3, the start times of the first exposure and the second exposure are both controlled by the third applier, which applies a single charge sweep-out pulse. In contrast, according to **Ohta**, image signals from fields A and B are apparently discarded in response to separate signals.

Therefore, independent claims 2-4 are allowable for the additional reasons noted above. Reconsideration and withdrawal of the rejection of claims 2 – 4 are respectfully requested.

The Yadid-Pecht et al. reference

Initially, we note that although the **Yadid-Pecht et al.** reference does not relate to a charge coupled device (CCD), as does the present invention, and instead relates to an image sensor.

The **Yadid-Pecht et al.** reference relates to image sensors, and, more particularly, to a technique for increasing the dynamic range of active pixel sensors (APS) by obtaining at least two different integration times for each active pixel (see, e.g., column 3, lines 35-39).

Different integration times for each pixel are obtained by simultaneously copying two rows of pixels 210, 220 separated by a number of rows Δ into memory cells of column-parallel signal chains 204, 206 (see, e.g., column 5, lines 18-31). The pixels copied to the column-parallel signal chains 204, 206 are simultaneously scanned for readout (column 5, lines 32-41).

The readout process continues until all rows for a frame have been read (column. 5, lines 42-43). By reading out two separated rows of pixels, each row is read twice such that two sets of data for every active pixel are produced. The two sets of data have different integration times (i.e., exposure times) because the same pixel is read out at different times, which different times are separated by a time lag for a row readout process multiplied by Δ (see column 5, lines 47-50). The integration time for signals copied into column-parallel signal chain 204 is $T_{1int} = (N-\Delta)T_{row}$, while the integration time for signals copied into column-parallel signal chain 206 is $T_{2int} = \Delta T_{row}$.

A detected image is reconstructed by reading out portions with long integration time and short integration time, as appropriate, according to lighter and darker portions of a scene (column 6, lines 24-31).

It is important to note that the process of copying the pixels to the column-parallel signal chains 204, 206 resets the pixels in the copied row and a new integration for the row is started (see, e.g., col. 5, lines 24-25 and 30-31).

Therefore, according to **Yadid-Pecht et al.**, the shorter integration time $T_{2int} = \Delta T_{row}$ begins *after* the longer integration time $T_{1int} = (N-\Delta)T_{row}$. In other words, after a row is copied into column-parallel signal chain 204 and then reset to start a new integration time, the same row is copied again at a time ΔT_{row} later (i.e., the second integration time) into column-parallel signal chain 206, and then reset.

Accordingly, **Yadid-Pecht et al.** do not disclose or suggest a generator for generating a still image signal of one screen on the basis of said first charge and said second charge, wherein said first period starts *simultaneously* with said second period, is shorter than said second period and is *overlapped* in time with said second period, as recited in claim 1.

In view of the above remarks, it is respectfully submitted that claim 1 patentably distinguishes over the cited prior art. Reconsideration and withdrawal of the rejection under 35 U.S.C. §102(e) are respectfully requested.

Furthermore, it is respectfully submitted that claim 5, which depends from claim 1, patentably distinguishes over the combination of **Yadid-Pecht et al.** in view of **Ishikawa et al.** for the same reasons as set forth above with respect to claim 1. Specifically, it is respectfully submitted that **Ishikawa et al.** do not alleviate any of the above-noted deficiencies of **Yadid-Pachet et al.**

Accordingly, reconsideration and withdrawal of the rejection of claim 5 under 35 U.S.C. §103(a) are respectfully requested.

New Claims

New claims 9 – 14 have been added by the present amendment. New independent claim 9 recites elements similar to those recited in allowable claim 6. It is respectfully submitted that new claim 9 distinguishes over the cited prior art for reasons similar to claim 6. New claims 10 – 14 depend either directly or indirectly from claim 9, and are allowable for the same reasons as claim 9.

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CONCLUSION

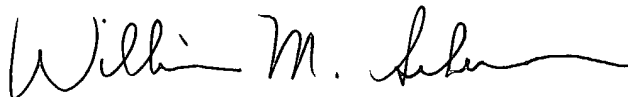
In view of the foregoing amendments and accompanying remarks, it is submitted that all pending claims are in condition allowance. A prompt and favorable reconsideration of the rejection and an indication of allowability of all pending claims are earnestly solicited.

If the Examiner believes that there are issues remaining to be resolved in this application, the Examiner is invited to contact the undersigned attorney at the telephone number indicated below to arrange for an interview to expedite and complete prosecution of this case.

In the event that any fees are due in connection with the filing of this paper, please charge any fees to Deposit Account No. 50-2866.

Respectfully submitted,

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